

MAGNETIC AND MAGNETOCALORIC PROPERTIES

OF Ni_{2+x}Mn_{1-x}Ga HEUSLER ALLOYS

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Ferromagnetic Ni_{2+x}Mn_{1-x}Ga Heusler alloys have drawn much attention in recent years due to their attractive properties such as shape memory effect, magnetoresistance etc. The large magnetocaloric effect (MCE) makes these alloys good candidates for magnetic cooling devices [1].

In this work we present measurements of the magnetization and the magnetocaloric effects by direct methods. Temperature dependencies of the low field magnetization measured by an original homemade setup. Direct measurements of the MCE (adiabatic temperature change ΔT_{ad}) were performed by a setup produced by AMT&C. Magnetic field up to 2 T was produced by a Halbach permanent magnet.

Polycrystalline ingots with Ni_{2+x}Mn_{1-x}Ga with different composition were prepared by arc-melt. The ingots were annealed at 800 – 1200 K for 48 hours.

Phase transition temperatures were determined from low field magnetization curves measured by original setup using Hall effect. The adiabatic temperature change ΔT_{ad} was measured by a direct method [2].

All alloys exhibit the positive MCE typical for 2nd order transition. The maximal MCE observed at the Curie point. For all alloys value of ΔT_{ad} are in 0.8 ÷ 2.2 K.

1. V.D. Buchelnikov, M.O. Drobosyuk et al. The Magnetocaloric Effect in Ni-Mn-X (X=Ga, In) Heusler Alloys and Manganites with Magnetic Transition Close to Room Temperature. *Solid State Phenomena*, Vols. 168-169 (2011) pp 165-1682.
2. Fayzullin R.R., Buchelnikov V.D., Taskaev S.V., Drobosyuk M.O., Khovaylo V.V. Experimental Study of Magnetocaloric Effect in Ni-Fe-Mn-Ga and Ni-Co-Mn-Ga Heusler Alloys. *Materials Science Forum*, Vols. 738-739 (2013) pp 456-460.